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OFFICE OF THE VICE PRESIDENT—  
AGRICULTURE AND NATURAL RESOURCES

OFFICE OF THE PRESIDENT  
Division of Agriculture and Natural Resources  
300 Lakeside Drive, 6th Floor  
Oakland, California 94612-3560

July 25, 1997

CALFED Bay-Delta Program  
1416 Ninth Street, Suite 1155  
Sacramento, California 95814

On behalf of The Regents of the University of California and Vice President W.R. Gomes, enclosed is one original and nine (9) copies of the proposal entitled "Preventing Introductions of Exotic Species from Ballast Water: The San Francisco Bay-Delta Ballast Management Education Program". The Project Leader is Jodi Cassell, Marine Advisor, University of California Sea Grant Extension Program.

Any questions concerning the project work should be directed to Jodi Cassell at (415) 871-7559. Questions regarding administrative matters such as contracts or other award documents should be directed to my attention at: University of California, Division of Agriculture and Natural Resources, 300 Lakeside Drive, 6th Floor, Oakland, CA 94612-3560.

Sincerely,

Carol Berman  
Contracts and Grants Coordinator  
(510) 987-0050  
/ht

cc: J. Cassell  
N. King  
without enclosure

DWR WAREHOUSE

97 JUL 28 AM 11:00

## I. Executive Summary

**Title:** Preventing Introductions of Exotic Species From Ballast Water: The San Francisco Bay-Delta Ballast Management Education Program

**Applicant:** Jodi L. Cassell, University of California Sea Grant Extension Program

**Project Description and Primary Biological Objectives:** This two year project will provide education and outreach about exotic or aquatic nuisance species (ANS) and ballast water management issues throughout the San Francisco Bay-Delta Estuary. The goals of the project are: 1) to provide education on ANS and ballast management issues for the maritime industry, resource agencies, and the general public in the San Francisco Bay-Delta region, and to demonstrate the key role of preventing introductions of exotic species, 2) to educate the maritime industry about ballast management practices and technologies, and to facilitate communication and cooperation between industry, regulators, and researchers, and 3) to facilitate industry interest and participation in the development of ballast water management techniques or technologies which provide an alternative to open ocean ballast exchange.

The primary biological objective is to promote practices that will prevent introductions of new exotic species to the Bay-Delta estuary. Native aquatic species and habitats (including open water and instream areas, wetlands, and riparian zones) throughout the estuary will benefit from the education program presented in this proposal, which will reduce undesirable species interactions in these ecosystems. Native species of concern to benefit from this project include most of the priority fish species mentioned in the CALFED RFP, as well as migratory birds and native plant species in the Bay-Delta.

**Approach:** The overall approach to the project is to provide education and outreach to the Bay-Delta maritime industry, resource agencies, and the general public in order to promote compliance with the National Invasive Species Act of 1996 (NISA 96) and stimulate industry interest in the development of alternative approaches to ballast water management. The project is composed of the following six major components or project tasks: 1) development and dissemination of a publication which highlights San Francisco Bay-Delta ANS and ballast management issues, 2) eight half-day video-conferenced ballast management forums, where experts will present information on ballast management and technology issues (to be held at the Ports of San Francisco, Oakland, Sacramento, and Stockton), 3) development of a ballast management web site, 4) a biannual ballast management newsletter which summarizes forum activities and provides additional information on ANS and ballast management issues in the Bay-Delta, 5) general outreach through the provision of articles to existing newsletters and agency publications, and through presentations at meetings and conferences, and 6) facilitation of an industry working group which will seek to initiate and secure funding for ballast management demonstration projects.

**Justification:** The San Francisco Bay-Delta has been seriously impacted by the introduction of ANS species to the estuary and its associated aquatic habitats. Recent research indicates that the estuary is dominated by more than 200 exotic species. Research also indicates that ballast water is the leading vector for introductions of ANS to the Bay-Delta. Hundreds of species have been found in ballast tanks and sediments, and the U.S. Coast Guard estimates that the estuary receives 650,000 cubic meters of unexchanged ballast water each month. Recent legislation, the NISA 96, requires

the U.S. Coast Guard to develop voluntary ballast management guidelines to prevent new introductions of ANS in U.S. waters. Ballast management is problematic for the West Coast maritime industry due to the reliance of open ocean exchange as the primary management technique (high seas on the Pacific Ocean make conditions frequently unsafe for open ocean exchange), and due to the fact that there has been no focused effort to educate the West Coast industry about ANS and ballast management issues. This project will provide an education program which will improve the industry knowledge base about these issues, as well as seek to stimulate industry interest and involvement in the development of new ballast management techniques and technologies.

**Budget Costs and Third Party Impacts:** The total cost of the two-year project is \$222,830. This is an educational project, and no third party impacts requiring mitigation are anticipated.

**Applicant Qualifications:** The project will be managed and directed by the UC Sea Grant Extension Program. The UC Sea Grant Extension Program works closely with more than 300 cooperating organizations in government, industry, and academia to provide technical information and assistance to marine audiences in California. This project fits well with the goals the National Sea Grant Network Plan for 1995 - 2005 for protection of coastal ecosystem health which specifically call for Sea Grant to address aquatic nuisance species by "carrying out outreach/education efforts to reach state and local agencies and commercial and private users". UC Sea Grant will work closely with the San Francisco Estuary Project (SFEP) Exotic Species Outreach Project (also proposed for CALFED funding), and this project will provide some funding for a SFEP staff member to work on two of the project tasks under this proposal.

Both UC Sea Grant and SFEP are have been extensively involved in programming related to exotic species in the Bay-Delta. SFEP hosted a forum on ballast water issues in June 1996. In August 1996, UC Sea Grant Extension Program initiated a pilot project to educate recreational boaters about zebra mussels in the 12 county San Francisco Bay-Delta area, which is nearing completion. In July 1997, Jodi Cassell was elected to serve as a co-chair of the Education Subcommittee for the Western Regional Panel on Aquatic Nuisance Species (WRP). The UC Sea Grant Program is also serving as the host organization for the 8th International Conference on Zebra Mussels and Aquatic Nuisance Species, which will occur in March 1998 in Sacramento.

**Monitoring and Evaluation:** All project activities will be reviewed by an advisory committee composed of technical experts, industry representatives, and environmental interests. Project activities will also be evaluated through surveys of participants to obtain information on the effectiveness of various outreach methodologies.

**Local Support/Coordination with Other Programs:** UC Sea Grant Extension will coordinate its activities with other organizations which are interested and/or involved in ballast water research, management, and outreach activities, including: 1) SFEP, 2) the U.S. Coast Guard, 2) California Department of Fish & Game, 3) Industry Groups (including the Pacific Coast Congress of Harbormasters and Port Captains, the Society of Naval Architects, and the Marine Exchange), 4) Mystic Seaport Lab (Dr. James Carlton), 5) San Francisco Estuary Institute (SFEI), 6) the Pacific Coast Sea Grant Programs, 7) the Ports of Oakland, San Francisco, Sacramento, and Stockton, 8) environmental interest groups, including San Francisco Bay Keeper, 9) the WRP, and 10) UC Davis Communication Services. The project will provide a vital link with industry for existing programs, and there is significant support for the project from all sectors listed.

## II. Title Page

**CALFED Bay-Delta Program  
1997 Category III  
Ecosystem Restoration Projects and Programs**

**Title:** Preventing Introductions of Exotic Species From Ballast Water:  
The San Francisco Bay-Delta Ballast Management Education  
Program

**Project Leader:** Jodi L. Cassell  
UC Sea Grant Extension Program  
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**Applicant:** The Regents of the University of California  
**Type of Org:** Educational Institution  
**Tax ID:** 94-6036494

**Technical Contact:** Jodi L. Cassell

**Financial Contact:** Carol Berman, Contracts & Grants Coordinator  
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**Participants  
and Collaborators:** UC Sea Grant Extension, Project Leader  
San Francisco Estuary Project  
Great Lakes Panel on Aquatic Nuisance Species  
Ports of Oakland, San Francisco, Stockton, and Sacramento  
Various stakeholder representatives, scientists, resource managers,  
and industry representatives and groups

**Project GroupType:** Group III: Services (Education)

**Authorized Signature:**   
Carol Berman, Contracts & Grants Coordinator

## II PROJECT DESCRIPTION AND APPROACH

This project will provide an outreach program to educate the shipping industry, government agencies, and the general public about ANS and ballast management issues relevant to the San Francisco Bay-Delta Estuary. The three overall objectives of the project are as follows: 1) to provide education on ANS and ballast management issues for the maritime industry, resource agencies, and the general public in the San Francisco Bay-Delta region, and to demonstrate the key role of preventing introductions of exotic species (and the difficulties and costs associated with post-invasion control), 2) to educate the maritime industry about ballast management practices and technologies, and to facilitate communication and cooperation between the maritime industry, regulators, and researchers concerned with ballast water management, and 3) to facilitate industry interest and participation in the development of ballast management techniques or technologies which provide an alternative to open ocean exchange. The project will be comprised of five major components:

- 1) A **general education publication** on West Coast ANS and ballast management issues. The publication will be provided to a variety of audiences including the San Francisco Bay shipping industry, the general public, and natural resource professionals. The brochure will be utilized for uses ranging from general education to assisting natural resource professionals with identification of exotics.
- 2) A series of **eight video-conferenced educational forums** to increase industry awareness and knowledge of ballast management issues. Forums will be one-half day events where individuals involved with the development of ballast management or ballast technology approaches will be invited to provide a presentation on their area of expertise. Locations of the forums will be rotated between the four major Bay-Delta ports of San Francisco, Oakland, Sacramento, and Stockton, and video-conferencing will be provided to allow for real-time participation by industry members who are unable to attend the meeting on-site.
- 3) The first **biannual newsletter and website** focused on ballast management and West Coast ANS issues. The newsletter will provide summary proceedings from the project forums, as well as current information on nationwide ballast technology and management research, and West Coast ANS issues. The project web site will contain the newsletter, listings of relevant journal and other articles, announcements, and linkages to other web sites. Additional **general outreach** will be pursued through providing articles and announcements to existing ANS and maritime publications and websites.
- 4) The formation of an **industry working group** which will provide a basis for initiation and funding of future San Francisco Bay ballast management demonstration projects.
- 5) **Evaluations** conducted for all project activities, and a final report which will summarize the response of project audiences to outreach methodologies, and discuss future needs for ballast water technical assistance and outreach.

**LOCATION/GEOGRAPHIC BOUNDARIES:** This project will address aquatic nuisance/exotic species throughout the Bay-Delta Estuary. As mentioned below, CAL-FED funding will be utilized to establish the San Francisco Bay region as "headquarters" for a larger West Coast Sea Grant project.

**EXPECTED BENEFITS:** This project will benefit native aquatic species and habitats (including open water and instream areas, wetlands, and riparian zones) by promoting practices

which will decrease future introductions of exotic introductions throughout the Bay-Delta estuary. Native aquatic plant and animal species, including priority fish and bird species listed under this RFP, have suffered serious impacts due to the introduction of exotic species. The prevention of ANS introductions will benefit native animal and plant species by decreasing competition, predation, and loss of food resources from exotics. Secondary and third party benefits will include reduced public expenditures for ANS control activities, and improved recreational and fishing opportunities within the estuary. The project furthers CALFED non-ecosystem goals by: 1) preventing introductions of exotic species which could clog water intake pipes and create problems for state and federal water conveyance systems and/or threaten levee stability, 2) improving aquatic habitats and improving the ecological functioning of the native Bay-Delta ecosystem, and 3) protecting resources for beneficial uses of the Bay-Delta system including shipping, recreation, and fishing.

This project will also benefit the West Coast maritime industry, regulators, environmental groups, and researchers as information is disseminated for the mutual interest of all involved. The project is strongly supported by each of the above groups who have also agreed to provide representatives on the project advisory committee.

Researchers and regulators will benefit from increased opportunities interaction and communication with industry provided by the project, which will enhance opportunities for collaboration on demonstration projects. The general public and other stakeholders will benefit from improved conditions in the Bay-Delta estuary.

#### **BACKGROUND AND BIOLOGICAL/TECHNICAL JUSTIFICATION**

In recent years, a significant amount of research has been done to document the presence and impacts of ANS species in West Coast estuaries. The Asian clam (Potamocorbula amurensis) and the Chinese mitten crab (Eriocheir sinensis), for example, may have been transported in ballast water and have been found in large and growing numbers in San Francisco Bay. Surveys of Potamocorbula have reported densities of over 16,000 juveniles/square meter (Cohen and Carlton, 1995). With such high densities, this planktonic filter feeder may be damaging the base of the SF Bay's food web, with resultant impacts on organisms throughout the Bay-Delta (Cohen and Carlton, 1995). The mitten crab bores holes in river banks and levees, which may contribute to erosion and create a need for costly restoration. The mitten crab also can host a parasite, the Oriental Lung fluke, which can be a significant human health threat (Cohen and Carlton, 1995).

Ballast water in transoceanic ships is the leading vector for the introduction of exotic or ANS to the San Francisco Bay-Delta. Ballast water provides trim, stability, propeller immersion, and maintains safe levels of hull stresses in various states of loading. When ballast is discharged in a destination port bay or harbor, however, organisms in this water are released into the ecosystem. Research by Carlton et al indicates that ships may carry as many as 50 species of plants and animals in their ballast water. Hundreds of species have now been found in ballast tanks and sediments (Carlton et al, 1995). Also, although recreational vessels are the more likely vector for transport, the European zebra mussel (Dreissena polymorpha) could be transported to the Bay-Delta via ballast exchange in freshwater ports, such as Stockton and Sacramento. A zebra mussel infestation in California could result in major ecological and economic impacts, such as clogging of municipal and agricultural water systems and alteration of aquatic food webs.

The reauthorization of the Non-Indigenous Aquatic Nuisance Prevention and Control Act (P.L. 104-332, 110 Stat. 4073) in October 1996 signaled Congressional recognition that exotic

species as an important management issue in aquatic ecosystems throughout the United States. The Non-Indigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPC 90) mandated ballast water management for vessels entering the Great Lakes, to prevent new introductions of exotics to the Great Lakes region. Under the reauthorization of this law in 1996, the National Invasive Species Act of 1996 (NISA 96), the development of voluntary ballast management guidelines for all other ships entering U.S. waters is required.

Ballast management strategies are currently limited to open ocean exchange. This practice ensures that port of origin ballast water is flushed into the open ocean where estuarine organisms are unlikely to survive (NRC, 1996). While open ocean exchange provides a reliable method for dealing with ANS, this practice can be dangerous for ships in the Pacific Ocean due to frequent storms and waves which often exceed the level of safety for ballast operations. In fact, NISA 96 provides exemptions from ballast management where rough seas could pose safety and ship stability problems. Although other types of ballast management and technology, such as micro-filtration, ozonation, and ballast micro-management strategies, are being explored by Sea Grant and other researchers, these alternatives do not yet provide workable options for industry use.

Widespread awareness of ANS and ballast management issues does not yet exist in the West Coast maritime industry. Among industry representatives that are aware of the issues, many have resisted becoming engaged in ANS issues due to apprehensions about the potential for regulated open-ocean ballast exchange or expensive ballast water technology retrofitting. In contrast, the Great Lakes shipping industry has been forced to confront ANS issues due to high profile and costly invasive species, such as the zebra mussel, and because of the NANPC 90 mandate for ballast management for ships entering the Great Lakes. The Great Lakes Panel (established under NANPC 90) has been involved in ANS research, control, and education activities since 1990. In 1996, the Lake Carriers' Association and the Northeast-Midwest Institute initiated the Great Lakes Ballast Technology Demonstration Project, a project that will retrofit a local commercial vessel with a micro-filtration system to remove exotic species from ballast water.

Some groups believe that regulation of ballast management is necessary to stimulate industry action on ballast management outside of the Great Lakes. This project, however, takes an alternative approach. We believe that, with education, the West Coast maritime industry can become a partner in developing strategies to prevent future ANS introductions into the San Francisco Bay-Delta system. Rather than waiting for a regulatory fix or an economic disaster, such as zebra mussel introduction, to stimulate new legislation, the project seeks to proactively address ANS issues in the Bay-Delta through an education and outreach effort to encourage effective implementation of NISA 96. Based on initial discussions with the West Coast shipping industry, there is clearly a need for and interest in outreach programs to educate the maritime industry on general ANS issues, ballast management practices, and the current regulatory framework under NISA.

Effective implementation of NISA 96 will require significant industry interest and participation. For instance the success of the voluntary ballast management guidelines is highly dependent on industry awareness and cooperation. NISA also calls for the Coast Guard, the Department of Commerce, and the Department of the Interior to work cooperatively to develop ballast management demonstration projects which integrate new technology for treatment of ballast water. These agencies, and any ballast water demonstration projects, will benefit from the

opportunities to interact with industry provided by this project. With decreasing agency budgets and staffs, it is increasingly important to pursue such projects which maximize the efficiency of agency efforts.

A major goal of this project is to set the stage for future West Coast ballast management demonstration projects. Due to problems with open ocean ballast exchange in the Pacific, the development of new ballast management technologies through demonstration projects will be critical to effective prevention of future ANS introductions in the West. Given the regional differences in the maritime industry, regions will probably need to pursue separate demonstration projects with differing technologies. Industry has noted, for instance, that outcomes from the Great Lakes demonstration project may not be applicable to the larger vessels typical of the San Francisco Bay. Clearly, industry expertise is vital for the development of effective and practicable ballast management solutions. This education program will bring the Bay-Delta maritime industry "up to speed" on ANS and ballast management issues and encourage them to take an active role in developing solutions to West Coast ANS management issues.

This project will serve as part of a larger, West Coast/Pacific Sea Grant initiative to provide education on ballast water issues. The Sea Grant project will be coordinated by UC Sea Grant, and will involve Sea Grant programs in Oregon, Alaska, Washington, and Hawaii, and University of Southern California Sea Grant. The Sea Grant Project also involves the San Francisco Estuary Project (SFEP), estuary projects throughout the West coast, and many of the same industry and agency staff. The Sea Grant Project is titled "West Coast Ballast Water Initiative: An Outreach Program to Improve Ballast Management", and was submitted to the National Sea Grant Office for funding in June 1997. A decision on this funding will occur in October 1997. A copy of this proposal can be provided to CALFED if needed.

#### **PROPOSED SCOPE OF WORK**

At the outset of the project, we will form an advisory committee with representation of the shipping industry, government trustee agencies, researchers, environmental organizations, marine professional organizations, and representatives from educational institutions, such as the California Maritime Academy and other West Coast Sea Grant Programs. Dr. Jim Carlton, of Mystic Seaport Lab (University of Connecticut), Dr. Andy Cohen, of the San Francisco Estuary Institute, and the Great Lakes Panel have agreed to serve on the project advisory committee. The advisory committee will meet two times per year to determine the direction of the publication, newsletter and forum activities, and will also "meet" via conference calls and review project materials as is necessary throughout the project. Quarterly and final technical and financial reports will keep CALFED apprised of the progress of the project.

Our approach will be responsive to advisory committee input, however, we envision the following six major program components.

1.) Industry and Public Outreach/Education on Aquatic Nuisance Species Issues. We will develop a publication which highlights five to ten aquatic species which are of particular concern for the Bay-Delta. The color publication will describe basic biology, identification, ranges, and known impacts of those organisms, and will provide information on mechanisms of ANS introduction and current management efforts. The publication will include information on all mechanisms of ANS introduction including ballast water discharges, recreational boating, shipping of ornamental plants and animals, aquaculture, and bait worm packing. If approved by the advisory committee, we will reduce costs for this publication by cost-sharing with the Great



Lakes Panel on the reproduction of an existing high quality publication which will be adapted to highlight West Coast issues.

The publication will be distributed to the general public, industry and agencies throughout the Bay-Delta region by Sea Grant, the SFEP, and other groups. We will also use this publication to generate mailing lists for the ballast water education forums and for the newsletter, by including, in the publication, a detachable card which may be mailed back to the project headquarters.

2.) Ballast Water Management Video-Conferenced Forums. We will host a series of eight one-half day forums where individuals currently researching ballast water technology or management alternatives will present their work to industry representatives and other invited participants. To encourage the participation of industry and government agencies from different locations in the Bay-Delta, we will host meetings at the four Bay-Delta ports of San Francisco, Oakland, Stockton, and Sacramento. To demonstrate support for the project, the ports have agreed to provide meeting space and expenses for the forums (see budget, in-kind expenses, task 3). In cooperation with UC Davis Communication Services, we will provide real-time video-conferencing of forums through satellite downlinks to allow for participation by industry representatives unable to attend the meeting on-site. Real-time video-conferencing provides a television presentation of an event at remote location, and allows viewers to participate in the meeting by asking questions of the speakers via phone, fax, or email.

After keynote presentations, a discussion and question and answer session will be facilitated. We expect that a very useful exchange of information will occur at the forums. Industry will learn about potential new technologies and researchers learn about practical applications and limitations of their research. We will also provide opportunities for informal interactions by holding refreshment breaks during and after the forum sessions, thus increasing the potential for collaboration between researchers and industry. Videotapes of the Forums will be made available for loan through the project.

3.) Ballast Water Management Web Site. The Ballast Water Management Newsletter will be placed on a web site developed by the project and linked to the SFEP and University of California Sea Grant (UCSG) web pages. The site will provide general information on West Coast ANS issues, ballast water technology, and announcements. The site will also provide linkages to other existing ANS web sites, including the Sea Grant Nonindigenous Species Site (SGNIS), and to other government and maritime industry site.

4.) Ballast Water Management Newsletter. A biannual newsletter will be published which summarizes information discussed in the forums, provides general information about ANS in the Pacific Region, and provides an opportunity for industry and public comments and/or contributions. The newsletter will provide a mechanism to reach industry members who are unable to attend the forums. Relevant information and articles on ballast water technology and management research from throughout the U.S., as well as an events calendar, will be included in the newsletter. We will also work cooperatively to share relevant information with other Sea Grant programs and agencies and existing ANS newsletters.

The newsletter will be the first of its kind to focus mainly on ballast management issues. We will also solicit articles from industry and others. A mailing list for the newsletter will be developed from forum participants and from inserts in the original West Coast ANS publication to be mailed by the project office.

5.) General Outreach. Articles from the Ballast Water Management Newsletter will also be

provided to relevant publications such as The Estuary (the SFEP Newsletter), maritime publications and professional organization newsletters. We will also use these platforms to announce forums and other events. In addition, we will distribute the results of this outreach effort through project reports, presentations at conferences, and journal articles when appropriate.

6) **Industry Working Group.** The industry working group will begin meeting during the second year of the project, and will be facilitated by the project leader. The San Francisco Bay industry working group will work collaboratively with industry groups throughout the West coast to initiate and secure funding for ballast management demonstration projects

#### **COORDINATION AND EVALUATION**

This project will provide an excellent vehicle for coordinating with a number of existing and new programs in the area of ballast and ANS management in the U.S. The most closely associated work in education and outreach is that of the Great Lakes Panel, which seeks to facilitate ANS research, control, and education activities, and is represented on our advisory panel. We will also coordinate our work closely with the newly formed task forces in Washington and Alaska, which are seeking to improve education and outreach in their respective regions.

We will work closely with Sea Grant staff from Oregon, Hawaii, and University of Southern California Sea Grant, who are cooperators along with UC Sea Grant Extension on a larger scale "Western Region" ballast education project which submitted to the National Sea Grant Office for funding consideration in June 1997 (see description above under "background" section). The project will also work closely with the SFEP Exotic Species Outreach Project (proposed for CALFED funding), and we will provide some funding for SFEP to work on two project tasks under this proposal (see budget, Tasks 2 and 6).

We will work closely with the newly established Western Regional Panel (WRP) mandated by NISA 96. We will also work cooperatively with the Coast Guard in providing input to the development of voluntary guidelines for ballast management, ballast monitoring programs, and demonstration projects as required by NISA 96. The State of California is currently considering the passage of legislation to prevent ballast exchange in State waters. We will continue to track this legislation, and we will coordinate with any State agencies involved in implementing this proposed bill.

As discussed, a project advisory committee, which includes representation from SFEP and the San Francisco Estuary Institute (SFEI), will review and evaluate project materials. Evaluations will be conducted for all project activities, and a final report will summarize the response of project audiences to outreach methodologies, and discuss future needs for ballast water technical assistance and outreach.

#### **IMPLEMENTABILITY**

The project will be coordinated with existing local, regional, national initiatives on ANS. The project has significant support, as evidenced by industry, scientist, and stakeholder commitments to serve on the project advisory committee and the commitment of ports to provide meeting space and expenses for ballast water forums. Special permits, easements and compliance with particular environmental laws and regulations will be required for this project. We will work with industry associations and groups such as the Pacific Coast Congress of Port Masters and Harbormasters to insure publicity for and industry participation in all project events.

## REFERENCES

- Carlton, J.T., D.M. Reid and H. van Leeuwen. 1995. *The Role of Shipping in the Introduction of Nonindigenous Aquatic Organisms to the Coastal Waters of the United States (other than the Great Lakes) and an Analysis of Control Options*. Washington, D.C.: U.S. Coast Guard and U.S. Department of Transportation, National Sea Grant College Program/Connecticut Sea Grant. USCG Report Number CG-D-11-95. NTIS Report Number AD-A294809.
- Cohen, A.N., and J.T. Carlton. 1995. *Biological Study. Nonindigenous Aquatic Nuisance Species in a United States Estuary: A Case Study of the Biological Invasions of the San Francisco Bay and Delta*. Washington, D.C. National Oceanic and Atmospheric Administration for the U.S. Fish and Wildlife Service and the National Sea Grant College Program, Connecticut Sea Grant. NTIS Report Number PB96-166525.
- Herbold, B. and P.B. Moyle. 1989. *The Ecology of the Sacramento-San Joaquin Delta: a Community Profile*. U.S. Fish and Wildlife Service Biological Report. No. 85(7.22) 106 pp. Slidell Louisiana
- IMO. 1993. Resolution A.774(18), *International Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges*. London: International Maritime Organization.
- IMO. 1996. *Marine Environmental Protection Committee Guidelines for Implementation of Annex VI of MARPOL 73/78. Unwanted Aquatic Organisms in Ballast Water*. London. International Maritime Organization.
- National Research Council. 1996. *Stemming the Tide: Controlling the Introductions of Nonindigenous Species by Ship's Ballast Water*. Washington D.C. National Academy Press.
- Weathers, K. and E. Reeves. 1996. The Defense of the Great Lakes Against the Invasion of Nonindigenous Species in Ballast Water. *Marine Technology*, Vol. 33, No. 2, 1996, pp. 92-100.

#### IV. Costs and Schedule to Implement Proposed Project

Project Phase and Task	Direct Labor Hours	Direct Salary & Benefits	Overhead* (10% MTDC)	Service Contracts	Miscellaneous & Other Direct Costs	TOTAL REQUEST	In-Kind & Matching Funds
<b>Task 1:</b> Formation & Administration of Project Advisory Committee	PI: 100 hrs Masters-level Research Assoc: 200 hrs Project Asst: 200 hrs	\$7,153	\$2,170		Phone, fax, modem \$714 Travel \$12,400 Copying & office supplies \$834 Meeting space & supplies \$800	\$23,871	PI salary Copying/office supplies Communications
<b>Task 2:</b> Development & dissemination of West Coast ANS publication	PI: 50 hrs RA: 800 hrs Project Asst: 240 hrs SFEP Staff: 360 hrs	\$20,444	\$4,319	\$7,200	Phone, fax, modem \$714 Copying & office supplies \$834 West Coast ANS brochure \$14,000	\$47,511	PI salary Communications, copying, office supplies Great Lakes match for brochure (\$10,000)
<b>Task 3:</b> Video-conferenced Ballast Forums	PI: 300 hrs RA: 400 hrs Project Asst: 440 hrs	\$14,890	\$5,484		Travel \$8,400 Copying & office supplies \$834 Video conferencing \$30,000 Phone, fax, modem \$714	\$60,322	PI salary Communications Copying/office supplies Meeting space & expenses
<b>Task 4:</b> Newsletter Development & Distribution	PI: 100 hrs RA: 1000 hrs Project Asst: 200 hrs	\$24,097	\$3,465		Printing costs \$8,000 Copying & office supplies \$834 Phone, fax, modem \$714 Postage \$1,000	\$38,110	PI salary Communications Copying/office supplies
<b>Task 5:</b> Web Site Development & Administration	PI: 160 hrs Project Asst: 840 hrs	\$9,334	\$1,105		Phone, fax, modem \$714 Computer & printer \$3,000 Computer software \$1,000	\$15,153	PI salary Copying/office supplies
<b>Task 6:</b> General Outreach	RA: 640 hrs Project Asst: 240 hrs SFEP Staff: 400 hrs	\$17,056	\$2,960	\$8,000	Phone, fax, modem \$714 Copying & office supplies \$834 Travel \$3,000	\$32,564	Phone, fax, modem Copying/office supplies
<b>Task 7:</b> Formation of Industry Group to Pursue Collaboration on Ballast Demo Project	PI: 50 hrs Project Asst: 100 hrs	\$1,480	\$245		Phone, fax, modem \$357 Copying & office supplies \$417 Staff Travel \$200	\$2,699	PI salary Communications Copying & office supplies
<b>Task 8:</b> Project Mgmt & Administration	PI: 100 hrs Proj Secy: 10% FTE	\$0	\$0		Office Rent \$2,600	\$2,600	PI salary Project secretary salary
<b>TOTAL PROJECT BUDGET:</b>		<b>\$94,454</b>	<b>\$19,748</b>	<b>\$15,200</b>	<b>\$93,428</b>	<b>\$222,830</b>	<b>\$63,885</b>

\*Except where specified otherwise, operations and maintenance costs are provided through overhead.

#### IV.a. BUDGET COSTS

**1. Basis/Need for CALFED funding to support the project:**

CALFED funding is required for each task to occur. The total request for CALFED Bay-Delta Program funds for this project is \$118,513 for Year 1 and \$104,317 for Year 2, for a total of \$222,830 over two years. In-kind support for the project totals \$30,723 for Year 1 and \$33,162 for Year 2, for a total of \$63,885 over two years.

The basis for CALFED funding for this project is that the project clearly addresses a priority goal listed under the RFP for development of educational projects to address the impacts of exotic species in the Bay-Delta. As mentioned, we have also submitted a proposal for funding through the National Sea Grant Office, for a larger-scale project, which will provide education on ballast management for the West Coast/Pacific region. Because exotic species are an extremely critical issue in the Bay-Delta, we believe that a high level of emphasis should be placed on the San Francisco Bay region. The provision of CALFED funds will enable us to "headquarter" the West Coast Ballast Management Initiative (if it is funded through Sea Grant) in San Francisco, and to focus a greater proportion of effort in the Bay-Delta area.

**2. Potential for incremental CALFED funding for distinct project phases:**

Because the project tasks are linked under this proposal, the option of separating out phases of the project for separate funding is not feasible. During the second year of this project, however, the industry working group will be formed and will work to develop proposals for ballast management and technology demonstration projects. Such projects would also be likely candidates for at least partial funding from CALFED in future proposal rounds.

**3. Contingency planning for anticipated current year and future year funding needs:**

**In-Kind Support:**

The University of California Sea Grant Extension Program will support the effort of the Project Leader, Jodi Cassell, Marine Advisor at the University of California's Sea Grant Extension Program. Ms. Cassell will devote 25% effort as Project Leader, assuming overall responsibility for all project activities and tasks. The University of California Sea Grant Extension Program will also provide some in-kind support for project phone, mailing, and office supply expenses.

The San Francisco Regional Water Quality Control Board, which houses and provides in-kind support for the SFEP, will support effort by Marcia Brockband, Director of the SFEP, to participate on the advisory committee and supervise an SFEP staff member's time on the project publication and public outreach activities. The SFEP will also provide in-kind support by covering phone and office expenses for SFEP staff working on the publication and public outreach activities for this project.

The Great Lakes Panel has agreed to provide \$10,000 in matching funds for development, production, and printing of the West Coast ANS publication (Task 2), enabling the project to reduce production costs and achieve a high quality publication that will be adapted to highlight issues important to the Bay-Delta ecosystem.

The Ports of San Francisco, Oakland, Sacramento, and Stockton have agreed to each provide meeting space and expenses funding for two ballast forums during the course of the project. At an estimated expense of \$400 per forum for room rental and expenses, this amounts to a \$3200 in-kind contribution during the two year project period.

Another form of in-kind support is provided by state trustee agency staff, industry experts, researcher, and environmental group participation in the project advisory committee, forums, and publication development.

#### **4. Partnership funding and commitments.**

Overall implementation of project task will be managed by the UC Sea Grant Extension Program. Sea Grant will work in partnership with a number of agencies and groups, as mentioned in the proposal. We will work most closely with the SFEP, which is applying for CALFED funds to develop a more general exotic species education program. This project will provide some funding for SFEP to perform specific project tasks (see Task 2 and Task 6).

As mentioned, the PI coordinated development of a larger-scale ballast education proposal for the entire West Coast and Pacific, which was submitted to the National Sea Grant Program. A decision on that funding will most likely be made in October 1997.

**Subcontract bid and evaluation process: Not applicable.**

#### **IV.b. Schedule Milestones**

<b>Project Task</b>	<b>Schedule Milestones</b>
Task 1: Formation & Administration of Project Advisory Committee	Throughout Year 1 & 2; Two meetings/year
Task 2: West Coast ANS Publication	Production: Month 6, Year 1 Dissemination: Months 6 - 12, Year 1
Task 3: Video-Conferenced Ballast Forums	Begin Month 6, Year 1; Four forums per Year
Task 4: Newsletter Development and Distribution	2 editions per Year; First edition produced, Month 6
Task 5: Web Site Development and Administration	Web site operational - Month 6, Continual maintenance over two year project period
Task 6: General Outreach	Throughout two year project
Task 7: Formation and Facilitation of Industry Working Group	Group formation: Month 1, Year 2 Four meetings during Year 2

**IV.c. Third Party Impacts: Not applicable**

## APPLICANT QUALIFICATIONS

The project will be managed and directed by the UC Sea Grant Extension Program. The UC Sea Grant Extension Program works closely with more than 300 cooperating organizations in government, industry, and academia to provide technical information and assistance to marine audiences in California. The mission of the Sea Grant Extension Program is to apply research results toward developing practical and acceptable solutions to marine resource concerns in California, the region, and the nation. This project fits well with the goals of both the NOAA Strategic Plan and the National Sea Grant Network Plan for 1995 - 2005 for protection of coastal ecosystem health. Specifically, the National Sea Grant Network Plan calls for Sea Grant to address aquatic nuisance species by "carrying out outreach/education efforts to reach state and local agencies and commercial and private users".

The San Francisco Estuary Project (SFEP) will serve as the major cooperator for this project. SFEP is part of the National Estuary Program (NEP) established by the United States Environmental Protection Agency. The mission of the SFEP is to promote effective management of the San Francisco Bay-Delta Estuary and to restore and maintain its water quality and natural resources by implementation of a Comprehensive Conservation and Management Plan (CCMP). This project will assist in implementation of an objective of the Aquatic Resources section of the CCMP, the development and implementation of management actions to control or eliminate undesirable non-indigenous species. Outreach and education about ANS and their incidental transport is currently among the top ten priorities of the SFEP.

Jodi Cassell (see attached resume) is the PI for the project, and will direct and manage the project, as well as provide time on all project tasks aside from Task 6, General Outreach. Jodi will be responsible for hiring and supervising the Research Associate and Project Assistant. Marcia Brockbank (see attached resume) will direct SFEP's Exotic Species Outreach Program, also being submitted as a proposal for CALFED funding, and will supervise SFEP staff being funded to perform specific tasks under this project and coordinate SFEP activities with the project.

Both UC Sea Grant and SFEP are currently involved in programming related to exotic species in the Bay-Delta, and have completed projects in this area. In June 1996, the SFEP initiated work on ANS issues by hosting a ballast water forum. The forum included presentations from researchers, agency representatives, and the maritime industry, and discussion of ballast water management issues. The forum was successful in generating some interest in ANS, ballast water management and regulations, and developing future needs assessment based on the SFEP's Comprehensive Conservation and Management Plan (CCMP).

In 1996, the UC Sea Grant Extension Program initiated a pilot project to educate recreational boaters about zebra mussels in the 12 county San Francisco Bay-Delta area. This project consists of a survey to assess baseline knowledge about ANS issues and zebra mussels, development of an educational brochure, and workshops to educate boaters, boating groups, agency staff, marina workers, and the general public about zebra mussels. UC Sea Grant also is currently serving as the Northern California lending center for the Zebra Mussel Traveling Trunk, which contains hands-on activities to teach students about ANS issues.

UC Sea Grant and the SFEP have been core members of the group which wrote the plan for membership and organization of the Western Regional Panel on ANS (WRP). The WP held its first meeting in July 1997, and Jodi Cassell was elected to serve as a co-chair of the Education Subcommittee for the Panel. The SFEP is currently a member of the Panel. The UC Sea Grant Program will also serve as the host organization for the 8th International Conference on Zebra Mussels and Aquatic Nuisance Species, which will occur in March 1998 in Sacramento. Jodi Cassell is a Co-Chair for the conference.

**JODI L. CASSELL**

**EDUCATION**

B.A. Harvard University, Biology, 1988

M.S. Oregon State University, Marine Resource Management, 1992

**POSITIONS**

Marine Science Field Instructor, Newfound Harbor Marine Institute/Catalina Island Marine Institute/Jekyll Island Marine and Environmental Education Program, 1988-89; Research Assistant and Teaching Assistant, Oregon State University, 1989-91; Technical Assistant, University of Oregon Micronesia Program, 1991; Dean J. Knauss Sea Grant Marine Policy Fellow, U.S. Senate, 1992-93; Program Officer for Marine Conservation, World Wildlife Fund, 1993-94; Marine Advisor, San Francisco and San Mateo Counties, University of California, Sea Grant Extension Program, Cooperative Extension, 1995 to Present.

**SELECTED PUBLICATIONS**

Josselyn M., Cassell J., and G. Coffman, (in press). Hydrogeomorphic Methodology Applied to Tidal Wetlands of San Francisco Bay.

Cassell J. (in press). Public Education to Thwart Aquatic Nuisances. California Agriculture. University of California, Oakland, CA.

Cassell J. and P. Olin (in press). Nonindigenous Species Workshop: Current Status and Research Needs Assessment. October 18-19, 1996, San Francisco, CA. California Sea Grant College System, La Jolla, CA.

Cassell J. 1997. Keep California Zebra Mussel Free (brochure). Department of Water Resources, Sacramento, CA.

Cassell J. and K. Schroeder, 1997. Steelhead and Coho Salmon Fact Sheet. University of California Cooperative Extension / Sea Grant, San Bruno, CA.

Cassell, J.L. and C. Carpenter, 1996. Conflicts of Interest: An Issue for Management of U.S. Marine Fisheries? World Wildlife Fund: Washington, D.C.

Cassell, J.L., J. Adelbai, and D. Otobed, 1992. A Comprehensive Conservation Strategy for the Republic of Palau. South Pacific Regional Environmental Program: Western Samoa.

Cassell, J.L., 1992. Recreational Boating on the Lower Columbia River: Demand Analysis and Preliminary Planning for Public Moorage Facilities. Oregon State Marine Board: Salem, Oregon.



Marcia L. Brockbank, Program Manager  
San Francisco Estuary Project  
c/o S.F. Bay Regional Water Quality Control Board  
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(510) 286-0780; fax (510) 286-0928  
E-mail: marciab@abag.ca.gov

Association of Bay Area Governments (ABAG) employee - currently on assignment from ABAG to the San Francisco Bay Regional Water Quality Control Board to provide program support for the San Francisco Estuary Project.

#### San Francisco Estuary Project

1994 - Present: Program Manager. The Estuary Project is a federal/state/local cooperative effort to promote effective management of the San Francisco Bay-Delta Estuary and to restore and maintain the Estuary's water quality and natural resources through implementation of the Comprehensive Conservation and Management Plan.

1988 - 1994: Public Involvement Program Manager. The public involvement program includes education and outreach activities to promote public understanding and knowledge about the Bay-Delta Estuary's natural resources and issues affecting those resources. The program's primary goals are to provide the public with opportunities for restoring and protecting the Estuary and for participating in the decision-making process for management of the Estuary.

1986 - 1987: Public Affairs Officer, League of Women Voters of the Bay Area and ABAG. Provided public involvement program support for the San Francisco Estuary Project.

1978 - 1986: Television Producer, KTVU, Channel 2 Television, Oakland, CA for the League of Women Voters, Community Affairs Department. Produced documentaries, election and issues programming, and "register to vote" and "get out the vote" public service announcements. Documentaries distributed nationally and internationally. Documentary recognition: California Water Pollution Control Association 1988; International Film & Television Festival of New York 1985; Nomination - Best Documentary, Community Affairs, Northern California Area Emmy 1984.

Education: B.A., University of Utah

VI. Compliance with standard terms and conditions. In accordance with instructions, enclosed is a signed Non-Discrimination Compliance Statement. There were no objections noted to the Standard Clauses--Contracts with Public Entities, but certain of the Terms and Conditions cited under Attachment D in the RFP may not be consistent with University of California policy or with existing agreed-upon provisions between the University and State of California agencies. Accordingly, the University would probably request deviation from such terms and conditions in the event an award is made under this program:

Payment Schedule: We anticipate that payment conditions and schedules would be compatible with the standard University procedures for billing extramural sponsors. The use of non-standard invoice forms and procedures creates unnecessary, excessive expenses. Therefore, an acceptable invoicing clause should provide for invoicing and financial reporting in accordance with the University's major cost categories (such as "salary", "supplies", "travel", etc.). It should be noted that the University's accounting system does not track expenditures by task in the manner indicated by the proposal budget. More detailed and source accounting documents are maintained by the University and made available in case of an audit which would be conducted at the request and expense of the sponsor. Also, to avoid the expenditure of University funds prior to receipt of grant or contract funds, it is University policy to obtain advance payments whenever possible.

Substitution: A substitution clause such as the one stated in Attachment D to the RFP could possibly infringe on the University's hiring practices and procurement regulations by allowing the State to require substitution of individuals or subcontractors. It may also create substantial unfunded liability for the University.

Rights in Data: Under UC policy, ownership to all data, research results, documents, copyrights and other intangibles is retained by the University and freedom to publish or disseminate research results is a major criterion of the appropriateness of sponsored projects. Any limitation on the use of research findings or information is strictly discouraged. It is possible to make a limited exception which would provide an extramural sponsor with a right to review publications for a reasonable time prior to issuance. However, it is clearly contrary to policy and would be unacceptable to assign the decision of what may be published by allowing *approval* by a sponsor. Furthermore, it may not be legally permissible under State laws which may require disclosure of all public records maintained by the University.

Indemnification: The State's Office of Risk and Insurance Management has reached agreement on a standard indemnity clause to be used between the State and the University. A copy of this provision is available for review upon request.

Termination: These provisions cited under Attachment D could create an unfunded liability for the University as the State may refuse to reimburse the University for costs already incurred on behalf of the State. UC must be able to cover its costs in the event of untimely termination. In such cases, the State should agree to reimburse the University for costs or other obligations incurred prior to the effective date of cancellation. Also, it is usual for UC to have a mutual right to terminate the agreement if the project becomes impossible for the University to complete.

# NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

The Regents of the University of California

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

## CERTIFICATION

*I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.*

OFFICIAL'S NAME

Carol Berman

DATE EXECUTED

7/25/97

EXECUTED IN THE COUNTY OF  
Alameda

PROSPECTIVE CONTRACTOR'S SIGNATURE



PROSPECTIVE CONTRACTOR'S TITLE

Contracts &amp; Grants Coordinator

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

The Regents of the University of California